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*A MARKER FOR INDICATING THE POSITION OF OBJECTS OR PARTS OF OBJECTS IN MICROSCOPICAL PREPARATIONS.**

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In making microscopical demonstrations how often is the teacher disturbed, and how much time is lost in finding exactly the object or part of an object that shows with the greatest clearness some special feature? Likewise in one's private study or for exhibition to friends, the special point that is on a slide is often the last to be found, much to one's discomfiture. That this is true, doubtless every microscopist knows from personal experience. It is also shown by the numerous devices that have been thought of to overcome the difficulty of refinding what is known to be upon a slide.

These devices may be divided into three great groups: (a) Those in which the preparation is in some way marked so that the part desired may be found on any microscope indifferently, and, (b), those in which the position of the object is registered by means of some special mark or scale on the microscope itself, in which case the same microscope must be used again to find the object, or the register is of no avail, and lastly, (c,) those in which some special device to be used with the slide, like the Maltwood finder is used. The marker herein described belongs to the first group in which the mark is made upon the specimen itself, so that it may be found by using any microscope. The device does not involve any radical departure from methods already long used and approved; it simply renders easy the accomplishment of the work. It is an apparatus for making a delicate ring of colored varnish around the object or part which is especially distinguished in a given preparation. As seen in the figures below, this is accomplished by having the apparatus take the place of an objective, preferably in a triple or double nose-piece or revolver. Then when the object is found, or when one is studying a preparation, and some feature that is desirable to find again is in the field, the marker is turned in place of the objective, and a ring made around the particular part. This is accomplished by having a delicate brush attached eccentrically upon the revolving part of the marker. This is lightly filled with colored shellac or other varnish, and the revolving part turned. For rings of different diameter the brush can be made more or less eccentric, either by bending the attaching wire or by sliding the brush carrier, depending upon which form of marker is used. (See Figs. 1 and 2.)

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*The apparatus here described has been denominated or named a *Marker*, as it actually marks or bounds the object in the preparation. The terms *Finder* and *Indicator* are also used, but these terms refer properly to devices which shall indicate the position of the object by some apparatus which registers or indicates when the object should be in the field, provided the slide is placed in a given position under the microscope.

The advantages of this device are as follows: (1) The ring is small enough so that the area to be explored in finding the object even with the highest power, requires but a short time; (2) the ring is plainly visible to the unaided eye and may be got into the field on one microscope as easily and surely as on another; (3) the shellac ring is colored, preferably with a transparent dye, so that objects may be seen through it. It then serves a good purpose in focusing on transparent objects, like micrometers, etc., when high powers are used, or for slides in which the objects are scattered, for one can tell when he is at about the right focus and thus avoid injuring the preparation. Over the circular ruling made with a diamond, as in the forms of Bridgman, May, and Winkel, the shellac ring has the advantage that it is easily removed with alcohol, if desired; it can be seen with the naked eye, is useful for the lowest and the highest power, and is not obliterated with the immersion fluid. In using this marker, shellac varnish, made as follows, has been found best: Bleached or unbleached shellac in 95% alcohol to saturation. This solution is allowed to stand till there is a clear part on top. This clear part is poured off and allowed to evaporate until it is slightly syrupy,—somewhat thinner than is ordinarily used for sealing covers or making cement cells; then to each 100 cc. of the varnish are added 10 cc. of Venice turpentine, and 10 cc. of castor oil, and sufficient alcoholic solution of some transparent dye, like fuchsin, to give a moderately deep color.

The amount of Venice turpentine and castor oil is double that used for ordinary shellac cement, as it is difficult to make the delicate rings in a warm, dry room on account of the rapid drying of the varnish, unless the drying is retarded by the oil and turpentine.

In using the marker, the delicate brush is filled with the varnish by means of a brush or small stick dipped in the bottle containing the varnish. Then the marker is lowered till the brush almost touches the cover-glass, and then the marker is revolved while, with the fine adjustment, the brush is brought in contact with the cover. In this way a uniform ring can be made. If the brush is brought in contact with the cover at first, without rotating the carrier (R), there is liable to be a thickening of the ring at the point of contact.

In rotating the revolving part, or carrier (R), the index or other finger is pressed up against the milling (M′), and drawn along. In this way quite rapid rotation can be made, and this rapid rotation is an advantage. After using the marker the brush should be cleaned with a cloth or piece of lens paper, wet with 95% alcohol. The most satisfactory brush for the marker has been obtained by cutting off an artist's pencil No. 5, and putting it upon the sharpened wire of the marker, as shown in the figures.

Fig. 1. The simple form of the Marker. This consists of a Male society screw (SS), to which is attached the rotating part (R), carrying the eccentric brush (B). A, axis, coinciding with the optic axis of the microscope. B, brush; M, milling on the Society Screw; M′, milling on the revolving part (R); R, revolving part of the marker; S, screw holding SS and R in apposition; W, Wire inserted eccentrically and carrying the brush (B). This wire is the kind used in wiring for electric door bells, etc., and is flexible. The eccentricity of the brush is easily varied by bending this wire toward or away from the axis.

Fig. 2. Sectional view of a Marker with special arrangement for rendering the brush eccentric. SS, Society screw for inserting the Marker in place of an Objective. S, screw holding SS and R in apposition. R, revolving part of the Marker; M and

M′, milling on the society screw and on the revolving part of the marker; B, brush; C, brass cylinder sliding laterally and serving to render the brush more or less eccentric; S, end view of the set screw shown in *Fig. 3*.

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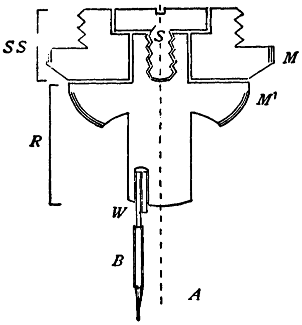

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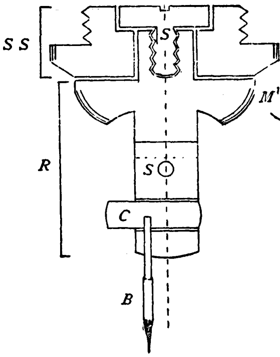

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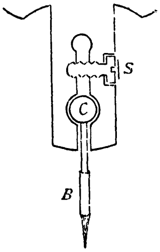
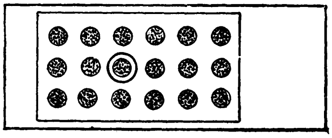


Fig. 3. Sectional view of the lower end of R, in *Fig. 2*, to show the appearance when the revolving part is rotated 90° from the position in *Fig. 2*. B, brush; C, end view of the sliding cylinder which serves to render the brush more or less eccentric; S, small screw to take up wear so that C will not slide too easily. It serves also for a set screw.



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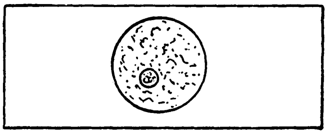

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Fig. 4. A slide of serial sections showing one with a ring indicating that this section of the series shows some feature with especial excellence.

Fig. 5. Preparation, as of blood or of diatoms, etc., with a ring around the part in which one or more of the elements show a special feature, or show the typical character with special clearness.

BIBLIOGRAPHY

It will be seen by consulting the following annotated bibliography that the three forms of *Markers*, *Indicators* or *Finders* were described between 1850 and 1860. There seemed to be during that decade especial activity in microscopical investigation. Indeed, clergymen and judges vied with scientific men in the zeal with which the revelations of the microscope were sought.*

'53. Amyot, Thomas E.—The finder. Quart. Jour. Micr. Science, Vol. I, (1 53) pp. 302-303. Register on a finder, which must be used again for finding the object. See also Vol. IV, (1856), pp. 151-153.

'56. Bailey, J W.—On a universal indicator for microscopes. Quart. Jour. Micr. Science, Vol. IV (1856), pp. 55-62. The mark is not on the specimen itself, but the position is indicated by employing a special arrangement for use with the slide and thus register any position.

'80. Beale, Lionel S.—How to work with the microscope. Fifth edition, revised. 1880 On pp. 47-49 are given the different finders or indicators then in use with a good discussion of the merits of each.

'89. Behrens, Kossel und Schiefferdecker.—Das Mikroskop und die Methoden der mikroskopischen Untersuchungen. 1889. Indicators, finders and markers are considered on pp. 47-49.

'55. Bridgman, W. K.—Another finder. Quart Jour. Micr. Science, Vol. III (1855), pp. 237-238. This, so far as I have been able to ascertain, is the first case in which an arrangement was used to make a circular ruling with a diamond around the object. It was accomplished by using an arrangement that goes on over the end of the objective and then is rotated, The apparatus is figured in the article and also in Beale (above) plate xvii, Fig. 11. Bridgman also has an article on a different Finder, Vol. I, pp. 303-304.

'91. Carpenter-Dallinger.—The microscope and its revelations. Seventh edition by W. H. Dallinger, 1891. On pp. 245-247 is given a discussion of the different finders with a preference for a mechanical stage with verniers by which the position of objects may be registered.

'80. Frey-Cutter.—The microscope and microscopical technology. By H. Frey, translated into English by Geo. R. Cutter. 1880. On p. 230 in a note is described the finder of Hoffmann, which consists of a cross (+) and an (×) on the stage on opposite sides of the opening. When an object is found that one needs to find again corresponding (+) and (×) are put on the slide exactly over those on the stage. In re-finding the place the slide is put in the original position.

'57. Farrants, R. J.—A micrometer object-finder. Transactions of the Roy. Micr. Soc., pp. 88-95 in the Quart Jour. Micr. Science, Vol. V, (1857). This arrangement is a glass slide ruled in squares and is the precursor of Maltwood's finder. See Maltwood.

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* In discussing the various finders or indicators, etc., many of the authors speak of the method of using an ink spot or a ring of ink or varnish put on roughly. It was the writer's habit for some years to make an ink spot on two sides of the object and then to make a delicate enclosing ring by means of the turn-table.

'84. Francotte.—In the Bull. Soc. Belg. Micr., XI (1884), pp. 48-50 and in Jour. Roy. Micr. Soc., 1885, p. 325, there is described the apparatus of an unknown inventor for marking slides. It is connected to the microscope like an objective and on the lower end is fitted with a ring with a groove. The groove in the ring is filled with varnish or other liquid and pressed down on the cover, thus leaving a ring around the object which is to be refound. The apparatus does not make neat rings and they can not be varied in size.

'56. Hodgson, Rev. W.—On defining the position and measuring the magnitude of microscopic objects. Quart. Jour. Micr. Science, Vol. IV (1856), pp. 209-212. Specially arranged cards to use with the specimen.

'83. Hogg, J.—The microscope, its history, construction and application. Tenth edition, revised. (1883.) Finders discussed on pp. 191-192.

'58. Maltwood, T.—On a finder for registering the position of microscopic objects. Trans. Royal Micr. Society, pp. 59-62. In Quart. Jour. Micr. Science, Vol. VI (1858). See also the various books on the microscope for a figure and description of this finder. Its precursor was the ruled squares on a special slide by Farrants. See also Amer. Naturalist, Vol. VI, p. 242. American Jour. Micr. and Popular Science, Vol. II, p. 115.

'82. May, Capt. O. T.—"Markers to make small circles on the cover glass around minute objects, rare diatoms, etc.; can be used on any microscope." Devised in 1881, advertised in 1882. No special article. The above is the advertisement. This marker consists of a part with society screw to take the place of an ordinary objective and below this is a revolving piece bearing a diamond on the end of a wire set somewhat eccentrically. It can be made more or less eccentric by bending the wire slightly. It has the general appearance of the marker in this article, *Fig. 1*, a diamond taking the place of the brush.

This marker of Capt. May was briefly described by Prof. R. Hitchcock in the Amer. Monthly Micr. Journal, Vol. VIII (1887), p. 207, and this description was copied into the Jour. Roy. Micr. Society, 1888, p. 113, and into the Zeitschrift für wissentschaftliche Mikroskopie, Bd. V. (1888), p. 352.

'55. Okeden, F.—On an improved finder for the microscope. Quart. Jour. Micr. Science, Vol. III, (1855) pp. 166-168. This is an attachment to the stage; it has mechanical movement in two directions with scale for each and like the modern mechanical stages with verniers or scales served to register the position of the object. The author states that the idea was suggested to him by B. Brodie.

'88 Pantocsek, Dr. Jos.—Über Indicatoren. Zeit. für wissentschaftliche Mikroskopie, Bd. V. (1888) pp. 39-42. Indicators in general are discussed and the writer's, which seems to have the principle of the one by Farrants and Maltwood, is figured and advocated.

'86. Schiefferdecker, P.—Über einen Apparat zum Markiren von Theilen mikroskopischer Objecte. Zeitschrift für wissentschaftliche Mikroskopie, Bd. III, (1886) pp. 461-464.

In this paper are discussed Finders or Indicators in general and a special description is given of the Marker of Winkel of Göttingen. This fits the microscope like an objective, has a revolving part bearing a diamond and an arrangement for rendering the diamond more or less eccentric. With it most beautiful and delicate circular rulings can be made on the coverglass. The principle and purpose are the same as in Bridgman's and May's apparatus. (See under Bridgman and May, above.) It is not easy to find the delicate circle after it is made, however.

'53. Tyrrell, Judge John,—The Finder. Quart. Jour. Micr. Science, Vol. I, 1853), p. 234. Special card or frame to use with the slide and register he position of the object. The card must be again used in finding he object.

'53. Wright, E. G.—Finder. Quarterly Jour. Micr. Science, Vol. I, (1853), pp. 301–302. A kind of framework with scale upon which the slide is placed, and the position of an object registered.

Modifications of the finders or indicators referred to in the above bibliography may be found in the Journal of the Royal Microscopical Society, 1880, 1881, 1882, 1884, 1885, 1887, 1889, 1892. They are referred to in the index under, "Finder, Indicator, and Marker." One might consult with advantage the Zeitschrift für wissentschaftliche Mikroskopie also.